

REMARKS

Further examination and reconsideration of the instant patent application in view of the above amendments is respectfully requested. Claims 1-9 and 11-27 remain pending. Claims 1-9 and 11-27 are rejected. Claims 1, 9 and 19 are amended herein. No new matter has been added.

35 U.S.C. §102(b) – Claims 1-5 and 19-22

Claims 1-5 and 19-22 stand rejected under 35 U.S.C. §102(b) as being anticipated by United States Patent 4,250,464 by Schade, Jr., hereinafter referred to as the “Schade” reference. Applicant has reviewed the cited reference and respectfully submits that the embodiments of the present invention as recited in Claims 1-5 and 19-22 are not anticipated by Schade in view of the following rationale.

Applicant respectfully directs the Examiner to independent Claim 1 that recites that an embodiment of the present invention is directed to (emphasis added):

An oscillator circuit comprising:
a relaxation oscillator circuit;
a first current source for establishing a first reference voltage for use in causing said relaxation oscillator circuit to operate in a first power mode to generate a clock of a first accuracy;
a second current source for establishing a second reference voltage for use in causing said relaxation oscillator circuit to operate in a second power mode to generate a clock of a second accuracy, wherein said first current source is not operable to establish said second reference voltage; and
a control coupled to said first current source and said second current source for switching between said first power mode and said second power mode, wherein said relaxation oscillator circuit generates

a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode.

Independent Claim 19 recites similar limitations. Claims 2-5 that depend from independent Claim 1 and Claims 20-22 that depend from independent Claim 19 provide further recitations of the features of the present invention.

Schade and the claimed invention are very different. Applicant understands Schade to teach an oscillator that provides distinct and different frequencies for separate modes of operation. With reference to FIG. 1 of Schade, a multi-mode oscillator “to provide distinct frequencies during separate modes of pulsating indications” is shown (col. 1, lines 41-44; emphasis added). In particular, Schade teaches that “the oscillator 14 will operate at two distinctly different frequencies depending on the output signal condition of the smoke detector 28. Of course, the charge rate of the capacitor 16 will be greater when the switch means 26 is rendered conductive by the signal from the smoke detector 28 and therefore, the frequency of the oscillator 14 will be higher for this condition” (col. 2, lines 40-47; emphasis added).

In contrast, embodiments of the claimed invention are directed towards an oscillator circuit including a relaxation oscillator circuit, “wherein said relaxation oscillator circuit generates a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode,” as claimed

(emphasis added). In particular, the claimed embodiments recite that the oscillator circuit generates a clock signal at substantially the same frequency, regardless of power mode. As described in the current specification, the different power modes provide a clock signal that operates at substantially the same frequency (e.g., 32 KHz), albeit with different levels of accuracy (page 13, lines 1-4). For example, a lower power mode will provide a clock signal with a lower accuracy than a clock signal generated in a higher power mode. The less accurate clock signal may be useful for certain applications, such as a sleep mode of a microcontroller, but not for standard operating mode (page 14, line 20 through page 15, line 19). In this way, the claimed embodiments provide an oscillator circuit that generates a clock signal of substantially the same frequency, but with different levels of accuracy, in different power modes.

Applicant respectfully asserts that nowhere does Schade teach, disclose or suggest the claimed embodiments of the present invention as recited in independent Claims 1 and 19, that these claims overcome the rejection under 35 U.S.C. § 102(b), and are thus in a condition for allowance. Applicant respectfully submits the Schade also does not teach or suggest the additional claimed features of the present invention as recited in Claims 2-5 that depend from independent Claim 1 and Claims 20-22 that depend from independent Claim 19. Therefore, Applicant respectfully submits that Claims 2-5 and 20-22 overcome the rejection under 35 U.S.C. § 102(b), and are in a condition for allowance as being dependent on an allowable base claim.

35 U.S.C. §103(a) – Claims 6, 23 and 24

Claims 6, 23 and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schade in view of United States Patent 5,426,384 by May, hereinafter referred to as the “May” reference. Claim 6 is dependent on independent Claim 1 and Claims 23 and 24 are dependent on independent Claim 19. Applicant has reviewed the cited reference and respectfully submits that the present invention as recited in Claims 6, 23 and 24 is not unpatentable over Schade in view of May.

As described above, Applicant understands Schade to teach an oscillator that provides distinct and different frequencies for separate modes of operation. Specifically, Schade teaches a multi-mode oscillator that provides “distinct frequencies during separate modes of pulsating indications” (col. 1, lines 41-44; emphasis added).

In contrast, embodiments of the claimed invention are directed towards an oscillator circuit including a relaxation oscillator circuit, “wherein said relaxation oscillator circuit generates a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode,” as claimed (emphasis added). In particular, the claimed embodiments recite that the oscillator circuit generates a clock signal at substantially the same frequency, regardless of power mode. The claimed embodiments provide an oscillator circuit that generates a clock signal of substantially the same frequency, but with different levels of accuracy, in different power modes.

In particular, Applicant respectfully asserts that the claimed embodiments recite that oscillator circuit generates a clock signal operating at substantially the same frequency in either power mode. Therefore, Applicant respectfully asserts that Schade does not teach, describe or suggest the oscillator circuit as claimed. In contrast, by teaching that the frequency increases as the mode is changed, Schade teaches away from such a configuration.

Moreover, the combination of Schade and May fails to teach or suggest this claim limitation because May does not overcome the shortcomings of Schade. Applicant understands May to teach a voltage controlled oscillator (VCO) with a symmetrical output. In particular, May does not teach, describe, or suggest a relaxation oscillator circuit, “wherein said relaxation oscillator circuit generates a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode,” as claimed (emphasis added).

Applicant respectfully asserts that nowhere does the combination of Schade and May teach, disclose or suggest the claimed embodiments of the present invention as recited in independent Claims 1 and 19, and that these claims are thus in a condition for allowance. Therefore, Applicant respectfully submits the combination of Schade and May also does not teach or suggest the additional claimed features of the present invention as recited in Claim 6 that depends from independent Claim 1 and Claims 23 and 24 that depend from independent Claim 19.

Therefore, Applicant respectfully submits that Claims 6, 23 and 24 overcome the rejection under 35 U.S.C. § 103(a), and are in a condition for allowance as being dependent on an allowable base claim.

35 U.S.C. §103(a) – Claims 7, 8 and 25-27

Claims 7, 8 and 25-27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schade. Claims 7 and 8 are dependent on independent Claim 1 and Claims 25-27 are dependent on independent Claim 19. Applicant has reviewed the cited reference and respectfully submits that the present invention as recited in Claims 7, 8 and 25-27 is not unpatentable over Schade.

As described above, Applicant understands Schade to teach an oscillator that provides distinct and different frequencies for separate modes of operation. Specifically, Schade teaches a multi-mode oscillator that provides “distinct frequencies during separate modes of pulsating indications” (col. 1, lines 41-44; emphasis added).

In contrast, embodiments of the claimed invention are directed towards an oscillator circuit including a relaxation oscillator circuit, “wherein said relaxation oscillator circuit generates a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode,” as claimed (emphasis added). In particular, the claimed embodiments recite that the oscillator circuit generates a clock signal at substantially the same frequency, regardless of

power mode. The claimed embodiments provide an oscillator circuit that generates a clock signal of substantially the same frequency, but with different levels of accuracy, in different power modes.

In particular, Applicant respectfully asserts that the claimed embodiments recite that oscillator circuit generates a clock signal operating at substantially the same frequency in either power mode. Therefore, Applicant respectfully asserts that Schade does not teach, describe or suggest the oscillator circuit as claimed. In contrast, by teaching that the frequency increases as the mode is changed, Schade teaches away from such a configuration.

Applicant respectfully asserts that nowhere does Schade teach, disclose or suggest the claimed embodiments of the present invention as recited in independent Claims 1 and 19, and that these claims are thus in a condition for allowance. Therefore, Applicant respectfully submits Schade also does not teach or suggest the additional claimed features of the present invention as recited in Claims 7 and 8 that depend from independent Claim 1 and Claims 25-27 that depend from independent Claim 19. Therefore, Applicant respectfully submits that Claims 7, 8 and 25-27 overcome the rejection under 35 U.S.C. § 103(a), and are in a condition for allowance as being dependent on an allowable base claim.

35 U.S.C. §103(a) – Claims 9, 11-13 and 16-18

Claims 9, 11-13 and 16-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over United States Patent 6,052,035 by Nolan et al., hereinafter referred to as the "Nolan" reference in view of Schade. Applicant has reviewed the cited references and respectfully submits that the present invention as recited in Claims 9, 11-13 and 16-18 is not rendered unpatentable by Nolan in view of Schade.

Applicant respectfully directs the Examiner to independent Claim 9 that recites that an embodiment of the present invention is directed to (emphasis added):

A microcontroller comprising:
a bus;
a processor coupled to said bus;
a memory unit coupled to said bus;
a plurality of input/output pins; and
a timer circuit coupled to said bus for performing a timing function,
said timer circuit comprising a relaxation oscillator circuit having a first power mode associated with a first current source and a second power mode associated with a second current source wherein said relaxation oscillator circuit generates a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode, said first power mode and said second power mode being switchable under a control, wherein said relaxation oscillator circuit comprises:
said first current source coupled to said control for establishing a first reference voltage for use in causing said relaxation oscillator to operate in a first power mode to generate a clock of a first accuracy, wherein said first current source is not used during said second power mode; and
said second current source coupled to said control for establishing a second reference voltage for use in causing said relaxation oscillator to operate in a second power mode to generate a clock of a second accuracy.

Claims 11-13 and 16-18 that depend from independent Claim 9 provide further recitations of the features of the present invention.

Applicant understands Nolan to teach an oscillator having two current generators that work in combination to generate a summed current, regardless of the operating mode of the oscillator. In order to compensate for temperature variations, Nolan teaches that the outputs of the two current generators are combined to generate a capacitor charging current. In particular, Nolan teaches that the currents of both the CTAT and PTAT current generators are required to provide the capacitor charging current. Moreover, Applicant understands Nolan to teach that the precision relaxation oscillator provides three operating modes, wherein the operating mode of the oscillation is not associated with a particular current generator. Specifically, both current generators are required to generate a summed current for each mode of operation (see col. 3, lines 13-39).

In contrast, embodiments of the claimed invention are directed towards a microcontroller including a “relaxation oscillator circuit having a first power mode associated with a first current source and a second power mode associated with a second current source wherein said relaxation oscillator circuit generates a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode,” and “wherein said first current source is not operable to establish said second reference voltage”, as claimed (emphasis added). In particular, the claimed

embodiments recite that a particular current source is associated with a particular power mode. Moreover, the claimed embodiments recite that the first current source is not operable to establish the second reference voltage, which is associated with the second power mode.

In particular, Applicant respectfully asserts that each current source as claimed is associated with a particular power mode, and that at least one current source is switched off for a very low power mode. Therefore, Applicant respectfully asserts that Nolan does not teach, describe or suggest a relaxation oscillator circuit including a first current source for use in causing the relaxation oscillator to operate in a first power mode and a second current source for use in causing the relaxation oscillator to operate in a second power mode and “wherein said first current source is not used during said second power mode”, as claimed. Moreover, by teaching that both current sources are required in any mode of operation, Nolan teaches away from such a configuration.

Furthermore, Applicant respectfully asserts that modifying Nolan so as to not require the use of both current sources would render Nolan inoperable for its intended purpose, as Nolan requires the use of both current sources to provide the described temperature compensation.

Moreover, the combination of Nolan and Schade fails to teach or suggest this claim limitation because Schade does not overcome the shortcomings of Nolan. As

described above, Applicant understands Schade to teach an oscillator that provides distinct and different frequencies for separate modes of operation. Specifically, Schade teaches a multi-mode oscillator that provides “distinct frequencies during separate modes of pulsating indications” (col. 1, lines 41-44; emphasis added).

Applicant respectfully asserts that Schade does not teach, describe or suggest a microcontroller including a “relaxation oscillator circuit having a first power mode associated with a first current source and a second power mode associated with a second current source wherein said relaxation oscillator circuit generates a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode,” and “wherein said first current source is not operable to establish said second reference voltage”, as claimed (emphasis added). In contrast, by teaching that the frequency increases as the mode is changed, Schade teaches away from such a configuration.

Furthermore, Applicant respectfully asserts that Schade teaches away from the suggested combination with Nolan. Nolan teaches an oscillator that requires both current sources to generate a constant output clock signal that accounts for temperature variations in any mode of operation. In contrast, Schade teaches an oscillator for generating clock signals for providing different frequencies by switching on an additional current source. Since Nolan explicitly requires two current sources in all operating modes and Schade is switchable between one and two current sources, the references teach away from such a combination. Moreover, because Nolan

teaches an oscillator that can provide a clock signal operating at a constant frequency at different modes and Schade teaches an oscillator that provides a clock signal operating at different frequencies in different operating modes, the references teach away from such a combination.

Applicant respectfully asserts that nowhere does the combination of Nolan and Schade teach, disclose or suggest the claimed embodiments of the present invention as recited in independent Claim 9, and that this claim is thus in a condition for allowance. Therefore, Applicant respectfully submits the combination of Nolan and Schade also does not teach or suggest the additional claimed features of the present invention as recited in Claims 11-13 and 16-18 that depend from independent Claim 9. Therefore, Applicant respectfully submits that Claims 11-13 and 16-18 overcome the rejection under 35 U.S.C. § 103(a), and are in a condition for allowance as being dependent on an allowable base claim.

35 U.S.C. §103(a) – Claims 14 and 15

Claims 14 and 15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nolan in view of Schade, further in view of May. Claims 14 and 15 are dependent on independent Claim 9. Applicant has reviewed the cited references and respectfully submits that the present invention as recited in Claims 14 and 15 is not rendered unpatentable by Nolan in view of Schade, further in view of May.

As described above, Applicant respectfully asserts that the combination of Nolan and Schade does not teach, describe or suggest a microcontroller including a “relaxation oscillator circuit having a first power mode associated with a first current source and a second power mode associated with a second current source wherein said relaxation oscillator circuit generates a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode,” and “wherein said first current source is not operable to establish said second reference voltage,” as claimed (emphasis added).

Moreover, as described above, Applicant respectfully asserts that Schade teaches away from the suggested combination with Nolan. Nolan teaches an oscillator that requires both current sources to generate a constant output clock signal that accounts for temperature variations in any mode of operation. In contrast, Schade teaches an oscillator for generating clock signals for providing different frequencies by switching on an additional current source. Since Nolan explicitly requires two current sources in all operating modes and Schade is switchable between one and two current sources, the references teach away from such a combination. Moreover, because Nolan teaches an oscillator that can provide a clock signal operating at a constant frequency at different modes and Schade teaches an oscillator that provides a clock signal operating at different frequencies in different operating modes, the references teach away from such a combination.

Moreover, the combination of Schade and May fails to teach or suggest this claim limitation because May does not overcome the shortcomings of Schade. Applicant understands May to teach a voltage controlled oscillator (VCO) with a symmetrical output. In particular, May does not teach, describe, or suggest a microcontroller including a “relaxation oscillator circuit having a first power mode associated with a first current source and a second power mode associated with a second current source wherein said relaxation oscillator circuit generates a clock signal operating at a frequency that is substantially the same in both said first power mode and said second power mode,” and “wherein said first current source is not operable to establish said second reference voltage,” as claimed (emphasis added).

Applicant respectfully asserts that nowhere does the combination of Nolan in view of Schade, further in view of May teach, disclose or suggest the claimed embodiments of the present invention as recited in independent Claim 9, and that this claim is thus in a condition for allowance. Therefore, Applicant respectfully submits the combination of Nolan in view of Schade, further in view of May also does not teach or suggest the additional claimed features of the present invention as recited in Claims 14 and 15 that depend from independent Claim 9. Therefore, Applicant respectfully submits that Claims 14 and 15 overcome the rejection under 35 U.S.C. § 103(a), and are in a condition for allowance as being dependent on an allowable base claim.

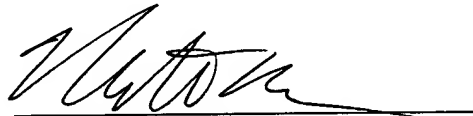
CONCLUSION

Based on the arguments presented above, Applicant respectfully asserts that Claims 1-9 and 11-27 overcome the rejections of record and, therefore, Applicant respectfully solicits allowance of these Claims.

The Examiner is invited to contact Applicant's undersigned representative if the Examiner believes such action would expedite resolution of the present Application. Please charge any additional fees or apply any credits to our PTO deposit account number: 23-0085.

Respectfully submitted,
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